

## Applying Behavioral Economics to Changing Health Behavior: The Case of Weight-Loss Management

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### Abstract

Despite documented short-term success, dieting has a very low success rates, most dieters regain their weight back within three to five years (IOM, 2003). Relapse, temporary loss of control, and return to old behavior is common in dieting. This paper presents some insights from a behavioral economics perspective to explain why people fail to stick to their goal for eating healthy diet in order to lose weight. Knowing why people fail to maintain a desired healthy behavior over time will go some way towards avoiding relapse. Know the why makes it much easier to handle the how when we need to. A better understanding of changing preferences could also shed light on the proper role of health promotion policy. Behavioral economics identifies a number of circumstances in which people seem to behave inconsistently. Identifying these conditions provide an understanding of what factors make it harder for dieters to resist attractive food, and will help dieters to resist temptation. A recent review of studies on the effectiveness of weight-maintenance strategies conclude that programs that incorporate continued skills in problem solving and coping with challenges, and techniques for sustaining behavior change lower the rate of relapse (IOM, 2004). The research summarized in this paper can be seen in the light of this overall goal.

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### Introduction

Americans spend in the aggregate many billions of dollars each year trying to lose weight through dieting or exercise, indicating the nation's desire to slim down. Estimates are that about half of men and two-thirds of women are trying to lose weight, which has helped fuel the \$42 billion annual weight loss industry in the United States. Despite documented short-term success, dieting has a very low success rates, most dieters regain their weight back within three to five years (Hill, 1999; IOM, 2003). Relapse, temporary loss of control, and return to old behavior is common in dieting. Alternatively, *weight maintenance* is referred to an initial weight loss that has been subsequently maintained for at least six months (Elfhag and Rossner, 2005). The question is, "why people fail to stick to their goal for eating healthy diet in order to lose weight?" The objective of this paper is to use the principles of behavioral economics to explain why we deviate from a

plan laid out in advance and we later on come to regret that we failed to stick to our plan. An understanding of the forces that shape individual health behavior choices is an essential ingredient in the development of effective weight-loss management, and policy to promote obesity prevention.

Behavioral economics describes ways people sometimes fail to behave in their own best interests (Loewenstein et al., 2003). The model helps to identify systematic patterns in errors that people make. Identifying these biases provide an understanding of what factors make it harder for dieters to resist attractive food, and will help dieters to resist temptation. The knowledge of these biases should help dieters to develop problem-solving skills in weight management. A recent review of studies on the effectiveness of weight-maintenance strategies conclude that programs that incorporate continued skills in problem solving and coping

with challenges, and techniques for sustaining behavior change, lower the rate of relapse (IOM, 2003). The purpose is not to provide an exhaustive summary of the vast literature relating to this issue, but rather to provide a framework in which to take a fresh look at a persistent public health challenge.

### **Dieting as a Choice Over Time**

Behavioral economics provides conceptual models for understanding relapse. One such concept of significance is that of how delayed rewards are discounted by individuals. Discounting of delayed rewards refers to the observation that the value of a delayed rewards is discounted (reduced in value or considered to be worth less) compared to the value of an immediate rewards. The concept of discounting provides an explanation of both impulsivity and loss of control exhibited by the dieter, and the implications to the problem of relapse prevention.

Diets have consequences which are realized only after long period of time, and they typically involve incurring a current cost in exchange for the chance of some future benefit. This difference in the timing of costs and benefits constitutes one of the major obstacles to dieting (Herman & Polivy, 2002). As every dieters know, it is one thing to plan for meeting caloric restrictions, but quite another to maintain it. On a daily basis, the dieter must withstand the temptation of appetizing foods. The success in dieting requires the individual to impose current preferences on the future. This will require the dieter to resist preference change and satisfy current preference.

Consider a behavior like starting an exercise program, which entails, say, an immediate cost of eight units of value, but will produce a delayed benefit of ten units. That's a net gain of two units, but it ignores the adjustment for the future value. If future events have perhaps half the value of present ones, then the ten units become only five, and starting an exercise program today means a net loss of three units (eight minus five). So we are reluctant to start exercising today. On the other hand, starting tomorrow devalues both the cost and the benefit

by half (to four and five units, respectively), resulting in a net gain of one unit from exercising. Hence, everyone is enthusiastic about going to the gym tomorrow. From a prior perspective, they want to behave relatively patiently, but as the moment of action approaches, they want to behave relatively impatiently. Such behavior is an example of dynamically inconsistent preferences. This tendency is often referred to as "hyperbolic discounting" (Ainslie, 2001; Laibson, 1997). This model describes our tendency to procrastinate on matters that have an immediate cost but a future payoff, like dieting, and exercise.

### **Interference Factors**

A number of factors tend to interfere with dieters' resolve to diet, and induce them to become impulsive. These factors are: habit formation, cue-elicited behavior, hunger, projection bias: hot-cold empathy gaps, stress, self-control, social influence, seductive present-moment, and awareness of self-control problem.

Under these impulsive conditions, the dieter gives too little weight to the future consequences relative to the immediate benefits. These factors normally tend to interfere with dieters' resolve to diet, and induce them to become impulsive or present-based preference.

### **Habit Formation**

Consumption over time leads to the accumulation of consumption capital stocks, similar to durable capital stock (Becker, 1992). This explains the difficulty of making a smoking cessation choice after many years of smoking (and accumulating a large consumption stock). It is generally reversible, in the sense that it depreciates (decays) unless maintained. In other words, if you don't satisfy the desire, it gets weaker to some extent. Hence, it is plausible, if you crave donuts every day but never get them, the craving may dwindle and disappear. So refraining from indulgence may be the most reliable pathway to the abatement of desire. The desire does not vanish entirely, but perhaps they do diminish. In a report on the experiences of those so-called "successful losers," the findings show that weight maintenance gets easier with

time. With time, the odds of regaining weight go down (Squires, 2005). People who maintain their new weight for two years have a greater likelihood of keeping it off for two more years. Those who maintain it for five years have even greater odds of maintaining their weight loss. Once you have the habit, you wouldn't think of not doing it. The behavior becomes automatic with practice (driving a car).

### **Cue-Elicited Behavior**

Psychologists call cue-elicited behavior "conditioned responses." Conditioned responses are built up through repetitive associations between cues and a particular consumption activity. Consider cues like the smell of cookies baking or the sight of a bowl of ice cream will induce craving in a dieter to order something sweet, reversing an earlier resolution to avoid the extra calories. The habit formation effects are turned on and off by the presence or absence of environmental cues (i.e., sensory inputs) (Laibson, 2001). This explains why those preferences often vary from moment to moment. Cues initiate physiological changes that prime and creates craving for immediate consumption. Consequently, delaying consumption becomes costly.

The natural tendency is to underestimate the impact of conditioning. Exposure to food cues makes it difficult to sustain a diet. It is recommended that dieters distance themselves from food cues that threaten one's resolve: dieters keep snack food out of view, or stop buying foods where "you can't eat just one," or by removing themselves from food cues (going for long walks). Distancing oneself from cues that threaten one's resolve is a general tactic for enhancing one's willpower (Hoch and Lowenstein, 1991). We simply need to remove the cues that cause us to overeat.

### **Hunger**

Hunger plays a critical role in intertemporal choice (Loewenstein, 1996). Hunger triggers a negative emotional response that leads people to become impatient. To be hungry is to be uncomfortable, and most of us experience hunger in the same way we experience pain as a signal to do something. Suddenly all other

concerns fall away. As people get hungrier, less attention is given to healthy diets. Also, we will enjoy our lunch more for being deprived of breakfast. Literally, hunger is the best sauce. However, in Lowenstein's terms, these factors promote eating not by increasing the desirability of the food but by reducing the dieter's will or ability to resist.

Thus, the intentions to follow healthy diet can be thwarted by hunger, and a busy schedule. A study by Mancino and Kinsey (2004) suggest that decreasing the interval between meals would reduce caloric intake by 45 calories a day. Over a year, this would result in a about a five pound reduction in total body weight, all else being equal. One ways to mitigate the hunger problem would be to plan ahead and make food choices before increasing vulnerability to hunger.

Increasing the variety of a food also increases how much we eat. To demonstrate this, Dr. Barbara Rolls showed that if people are offered an assortment of three different flavors of yogurt, they are likely to consume an average of 23 percent more than if offered only one flavor. This behavior results from what is called "sensory specific satiety." This is a phenomenon in which the decrease in the palatability and acceptability of a food that has been eaten to satiety are partly specific to the particular food that has been eaten (Rolls, 2005). This is analogous to the situation in which the child is "full of vegetables" but nevertheless has ample "room for dessert." The variety in our diets keeps us from tiring of the taste of the food. This decreases the feeling of satiation - feeling full - so humans and animals are more likely to overeat when they are in a situation where they can taste different foods. A smart strategy is never to have more than two items on our plate at any one time. You can go back if you are still hungry, but the lack of variety slows you down, and you end up eating less. Research on sensory-specific satiety would also suggest that meals composed of foods with similar sensory qualities (e.g., taste, shape, color) may reduce intake within a meal.

### **Projection Bias: Hot-Cold Empathy Gaps**

Projection bias is defined as falsely projecting current transient preferences on to the future. For instance, people in hot states tend to overestimate how long those states will last, a phenomena that Loewenstein and O'Donoghue (2003) refer to as a "hot-to-cold empathy gap," or "projection bias." This error suggests that people project their current preferences onto their future selves.

People tend to underappreciate the effects of changes in their states, and hence falsely project their current preferences over consumption onto their future preferences. When in a "cold" state (i.e., not hungry), it is difficult to imagine what it would feel like to be in a "hot" state or to imagine how one might behave in such a state. Likewise, when in a "hot" state (i.e., craving) people have difficulty imaging themselves in a cold state and thus miscalculate the speed with which such a state will dissipate. It supports the age-old folk wisdom that shopping on an empty stomach leads people to buy too much. People who are hungry act as if their future taste for food will reflect such hunger.

Read and van Leeuwen (1998) provide evidence of projection bias with respect to hunger and food choices. Office workers were asked to choose between healthy snacks (apples and bananas), and unhealthy snacks (beer nuts and chocolate bars) that they would receive in one week. Subjects were approached to make the choice either when they were hungry (late in the afternoon) or satiated (immediately after lunch). An advance choice was made one week before the time of consumption, and an immediate choice just moments before (that is, they could change their mind). Of the 49% who chose a healthy snack in advance, 74% changed their mind when they actually had to execute their choice. People who were hungry when they made the choice were more likely to opt for unhealthy snacks, suggesting that people were projecting their current tastes onto their future tastes.

In response to hot and hasty decision making, cooling-off periods that force people to delay

taking action for some duration — and in particular, allow them to reevaluate their decisions free from heat-of-the-moment impulses — could be useful. Cooling-off strategies are potentially useful in any situation featuring transient hot states that cause people to make distorted decisions and produce consequences that are difficult to reverse. Of course, a better idea yet is not bring impulse foods in the house to begin with. Eat before you shop, use a list, and stick to the perimeter of the store. That is where the fresh foods hang out.

### **Stress**

Hunger, of course, is not the only reason people eat. Stress, boredom and pleasure all come into play. We live in a world that entices us to relax and eat – a lot. A recent study shows that the tendency to overeat in the face of chronic stress is biologically driven (Dallman et al., 2005). Stress hormones increase the salience of rewards. They tell the brain, go get the goodies. It can be comfort food or other rewards like drugs, or sex. In a lab study when scientists added stress hormones to rats' brains, the animals remained stressed. But when they fed them sugar, the animals calmed down. When life is not going so smoothly and people reach for goodies full of fat and sugar, they are doing more than surrendering to cravings. Comfort foods like chocolate cake and ice cream literally blunt the body's response to chronic stress.

Baumeister and colleagues (1994) argue that emotional arousal has the effect of narrowing attention to the most perceptually salient stimuli (for example, food) and drawing attention away from broader and more abstract concerns such as dieting. For example, a person may be dieting successfully in the hope of looking good in a swimsuit next summer – but intense emotional distress makes next summer seem impossibly far away and hence irrelevant, whereas consuming that entire cheesecake holds the (possibly illusory) promise of feeling better in the next few minutes.

According to Herman and Polivy (2002), negative mood may call into question the value of future weight loss, and make more attractive the current, short-term reward of eating

attractive food. The distressed dieter experiences a disruption in her motivation to abstain, and no longer cares so much about distant and doubtful goals. Short-term gratification replaces long-term objectives at the top of the motive hierarchy, and the result, especially in the presence of attractive food, is indulgence. Dieters usually come to regret this decision, once the food is eaten and guilt is added to whatever distress obtained initially.

Intoxication is another factor that uninhibits eating in dieters, also known as *alcohol myopia*. Apparently, alcohol has the effect of focusing one's attention on the most salient stimuli (much as distress does). Alcohol tends to stimulate appetite, especially the intake of salty and fatty foods. In one study, subjects consumed nine to seventeen percent more calories after a single drink than those who had nothing to drink. A disproportionate number of the calories came from potato chips (Caton et al., 2004).

### **Self-Control Comes in Limited Quantities**

The self-regulatory strength theory (Baumeister et al., 2003) suggests that we have a limited amount of energy available to cope with trouble and conflict. If we expend SRS on one activity (for example, resisting a particular temptation) then we may deplete SRS resources and have less strength available for some other challenges (for example, resisting another temptation). This model suggests that people who exert a great deal of self-control in one domain (for example, dieting) may have less energy available in other domains. Thus, self-control, whether used to pass up the office cookie plate or to struggle against temptations like alcohol and tobacco, operates like a renewable energy source rather than a learned skill or an analytical thought process. Thus we would expect that dieters might be particularly self-indulging when it comes to, say, shopping, sex, or other sins.

Baumeister (2003) showed that individuals had less physical stamina and impulse control, and increased difficulty with problem-solving activities after completing a variety of tasks that required some measure of self-monitoring and effortful activities. Shiv and Fedorikhin (1999)

asked respondents to memorize either a two-digit number (low cognitive demand) or a seven-digit number (high cognitive demand). They were then to walk to another room to report this number. On the way, they were offered a choice between two snacks, chocolate cake (more favorable affect, less favorable cognitions) or fruit salad (less favorable affect, more favorable cognitions). The researchers predicted that the condition with high-memory load (seven digits) would reduce the capacity for deliberation, thus increasing the likelihood that the more affectively favorable option (cake) would be selected. The prediction was confirmed. Chocolate cake was selected 63% of the time when the cognitive/memory load was high and only 41% of the time when memory load was low.

The implication for dieters is that even if the motive to diet remains intact when they are upset, they can not summon the strength to simultaneously cope with distress and resist temptation in the form of food for lack of resources. Something has to give, and more often than not, resistance to temptation is what suffers (Polivy et al., 2005).

Self-control exercises may help build the "strength" of self-control over the long run. The SRS theorists have suggested that SRS can be cultivated – just as muscular strength can be developed – so that repeated exercises of self-control in one domain (such as dieting) may make future displays of self-control easier, both in the domain of dieting and in other domains. Baumeister (2003) suggests that sleep may be one way that individuals can replenish self-control. Most forms of self-regulation failure escalate over the course of the day, becoming more likely and more frequent the longer the person has been deprived of sleep. Positive emotional experience may also help replace expended self-control energy.

### **Social Influence**

The social contexts influence our eating behavior. Social factors have a powerful influence on tastes. Our tendency to conform can lead to erroneous judgments, including overeating. The literature on co-action effects

indicates that eating and drinking behavior is strongly affected by the presence of others, though few people seem to be aware of the effect. It seems that our appetite depends to a large degree on whether we have company, and on what our company is up to. Zajonc (1965) reviews research that shows that rats, chickens, and puppies eat significantly more when coupled with other hungry individuals. An apparently fully sated chicken, he reports, will eat up to two thirds as much again when introduced to a hungry companion chicken (Roth, 1999). Similar co-action effects have also been demonstrated in humans. Watson and Sobell (1982) found that black and white males participating in a beer taste test drank significantly more — on the average about twice as much — when paired with a heavily drinking companion, than when paired with a companion who was not drinking at all.

Herman et al. (2003) reported subjects ate fewer cookies when in the presence of a non-eating observer than when alone, and that they tried to match the intake of the companion when both were eating. Roth explains observed behavior as the result of two social norms — one in favor of minimal eating, and one in favor of matching the food intake of the other — ultimately driven by a concern for impression management. Studies have confirmed that many people (especially women) eat less on dates or in other situations where people can see them than when they are alone.

When we are with other people, we often lose track of how much we are eating. We eat longer than we otherwise would, and we let others set the pace for how fast and much we eat. When we are with others, we tend to mimic the speed at which they eat and how much we eat. The average amount others eat suggests that amount that is appropriate for us to eat (Wansink, 2006). This may also be a contributing reason why couples and families tend to be similar sizes. If there is a majority of overweight people in a family, the frequency, quantity, and time spent eating puts more pressure on a person who is trying to lose weight. Weight can be inherited, but it can be contagious.

### **The Seductive Present-Moment**

We often want instant gratification right now, and want to be patient in the future, such as eating highly caloric foods, while planning diet starting tomorrow. If you ask people, 'Which do you want right now, fruit or chocolate?' they say, 'Chocolate!' But if you ask, 'Which one a week from now?' they will say, 'Fruit.'

Studies in the field of *neuroeconomics* illustrate that we are rarely of one mind. Neuroeconomics attempts to study behavior by studying the neural mechanisms most responsible for behavior. The decision could be the result of competition between two different neuronal systems. Accordingly, the decision could be the result of competition between two different neuronal systems. One system supports impulsive choices, and the other system supports the cognition (McClure et al., 2004). The research involved imaging people's brains as they made choices between small but immediate rewards or larger awards that they would receive later. The study showed that decisions involving the possibility of immediate reward activated parts of the brain influenced heavily by brain systems that are associated with emotion. The study concluded that impulsive choices or preferences for short-term rewards result from the emotion-related parts of the brain winning out over the abstract-reasoning parts.

Our emotional brain has a hard time imagining the future, even though our logical brain clearly sees the future consequences of our current actions. Our emotional brain wants to order dessert and smoke a cigarette. Our logical brain knows we should go for a jog and quit smoking. The results help explain how and why a wide range of situations that produce emotional reactions, such as the sight, touch or smell of a desirable object, often cause people to take impulsive actions that they later regret. Such psychological cues are known to trigger dopamine-related circuits in the brain similar to the ones that responded to immediate rewards in the current study. This also explains some aspects of the addictive behavior, such as why addicts become so focused on immediate gratification when they are craving a drug. The dopamine-related brain areas that dominate

short-term choices also are known to be activated when addicts are craving drugs.

The limbic system seems to radically discount the future. While the analytic system's role remains constant from the present moment onward, the limbic system assumes overriding importance in the present moment, but rapidly recedes into the future and the emotional brain reduces its activation. This explains impulsiveness. For example, the slice of pizza that is available right now overrides the dietary plan that the cognitive brain has formulated. Most who have given into temptation will recognize the pattern — the resolution to refrain from eating forbidden (or quantities) foods, followed by the collapse of the resolution. When consumption is distant, there is a preference for virtue. When consumption is imminent, however, preferences reverse in the direction of temptation. There is only one thing that is strong enough to defeat the tyranny of the moment, and that is habit that work for you than against you.

#### **Awareness of Self –Control Problem**

Being aware of self-control problems can mitigate self-control problems. O'Donoghue and Rabin (1999) make a distinction between sophistication versus naivete. A sophisticated individual realizes that she will betray herself in the future, and thus undertakes actions now which restrict future behavior. A naïve individual is fully unaware of her future self-control problems and therefore prone to (wrongly) predict that she will behave herself in the future. This suggests that sophistication might help when we want to quit overeating. Sophisticated diners know that once faced with temptation, they will succumb. They will be reluctant to go to a restaurant, even one that offers a healthy menu, unless they believe it will help them to achieve the goals they have set while they were in their 'right mind.' In contrast, naïve diners believe (incorrectly) that they will eat healthy food, and therefore may plan to

behave one way but in fact behave differently. A naïve person may repeatedly delay quitting overeating believing she will quit tomorrow and this could lead to significant harms.

Naïveté about future self-control problems can generate harm because the person fails to engage in such "self-management". Sophistication is "good" because it helps overcome self-control problems. Although the harm generated by individual decisions to indulge could be small, but the accumulated harms generated by many decisions to indulge can be quite large. For example, cutting only 100 calories a day from our diets would prevent weight gain in most of the U.S. population (Hill and Peters, 1998).

Sophisticated individuals who understand their self-control problem take steps to combat it. If a person is aware of her future self-control problems, and in particular recognizes the situations in which she is likely to indulge, then she may make "commitments" that help prevent this indulgence. She might, for instance, alter a situation in a way that will reduce the likelihood of indulging (e.g., she makes sure to have only healthy desserts in the house) or she might choose to avoid the situation altogether (e.g., she chooses to have no desserts in the house).

#### **Conclusion**

This article explains why diet preferences often vary from moment to moment. The purpose was to enhance understanding of decision-making processes that underlie maintaining a desired healthy behavior over the long term. Mark Twain once said that "Quitting smoking is easy. I've done it a thousand times." The long-term maintenance of healthy lifestyle requires paying attention to why health preferences often change from moment to moment. Behavioral economics realizes that most behaviors are driven by the moment. Thus, the nitty-gritty details of execution, on a daily basis, is crucial for the maintenance of health behavior.

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